

DEBURRING DIE-CASTINGS BY WET VIBRATORY PLANT

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Deburring Die-Castings by Wet Vibratory Plant

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Die-castings may usually not be sold as produced. They have to /6* be deburred, e.g. via vibratory finishing with corundum chips. Burrs occur especially at those points at which the die-cast mold is constructed from various parts.

Deburring as a Task in Manufacturing

Deburring includes the removal of
the projections,
the overflows,
the separation burrs at the mold separation plane, the slides
and cores, the insertion partitions, the insertion parts and
the ejectors,
burrs formed due to aging and soldering points in the mold,
burrs formed due to pulling points on the die-cast etc.

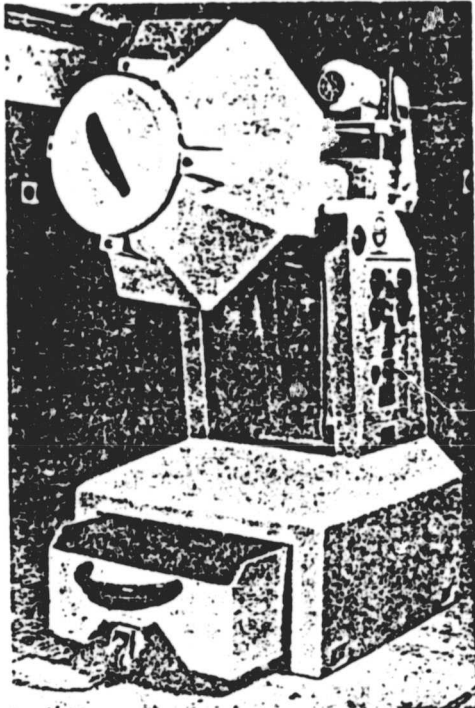
The wet method of deburring described here is usually carried out subsequent to a mechanical operation of stamping, drilling, milling, turning etc. in which the larger burrs are already removed. The smaller burrs, which previously had to be removed by hand with files or scrapers, may now be removed very inexpensively via wet vibratory plant¹. Advantages of this procedure are the savings in personnel and a more regular deburring, which could not be achieved manually.

Wet deburring methods in vibration containers driven by motors permit the simultaneous deburring of a larger number of pieces of die-castings within 8 to 30 minutes.

1) H.-M. Loeschbart, Giesserei 49, No. 19, p. 629/34 (1962).

* Numbers in the margin indicate pagination in the foreign text.

Mechanical deburring may also be carried out in barrels, in rotating, usually multiple-cornered containers (Figure 1). In the barrel method forces are transmitted from one die-casting to the next by means of agitation, so that a portion of the burr is removed or hammered into the die-casting. The surface of the die-casting is usually somewhat shiny, but also contains fine impressions caused by the continuous hammering of the die-castings against one another.



The deburring by means of wet vibratory finishing is carried out in lined, vibrating containers filled with die-castings, abrasives and compounds. The throughput of die-castings increases substantially compared with the barrel method, since the vibration induces strong motions of the die-castings relative to the abrasives. The die-castings are polished smooth.

Figure 1: Barrel Machine, According to¹.

Operation Means for the Vibratory Finishing

Included in the vibratory container are -

1. Chips,
2. Compounds,
3. Water and
4. Die-castings.

The container is filled to approx. 80%.

1) Report of the TA Roto-Finish of the Metallgesellschaft AG, Frankfurt (Main).

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The vibrating container induces motion of the chips as abrasive relative to the die-castings, so that all projecting edges on the die-casting, especially the burrs, are ground away. There is a wide variety of natural and synthetic materials for the chips. Usually synthetic corundum is cinkered to certain abrasive forms. The size of the chips ranges from 5 to 30 mm. There are many shapes and these may be chosen from a wide range offered on the market (Figure 2). It is advisable to limit the shapes to a few versatile types for reasons of economy. The hardness of the abrasive grain amounts to 9 degrees on the Mohs scale, and a liter of corundum chips weighs approx. 2.5 kg.



Figure 2: Abrasives for Vibratory Finishing

The selection of chips based on trials and experience:

large chips result in greater cutting performance,
small chips result in smoother surfaces.

The chips may not lodge in the part, so that a correct choice in chip shape, type and size is required. Determination of these parameters should be contained in the production plan. If chips lodge in a part, subsequent handling could cause tool breakage, making a one-hundred percent control of the parts necessary. Vibratory finishing replaces manual polishing or immersion grinding. When very high surface quality of die-casting is required, e.g. for a galvanic treatment, synthetic chips are applied for the final treatment.

The compounds are water soluble chemicals. These have a chemical /7 effect on the die-castings and chips in the vibration containers. The compounds are therefore also chosen in accordance with the metals to be treated. They assist in the abrasive effect of the chips, influence the metallic coloration as well as the shine of the die-castings and due to their moistening additives they clean the die-castings, chips and container walls.

The compound is water soluble. The chemical solution comes into contact with the die-castings and chips. The water conducts the abrasive product particles from the die-castings and chips to the container base, thereby maintaining chip abrasiveness. Water also reduces the noise level of the vibratory plant by dampening the impact of die-castings and chips on one another. The friction heat created is partially absorbed by the water and conducted away from the die-casting.

Machine Designs

Since the introduction of the vibratory finishing procedure a large variety of containers have been designed. A survey of the design types is shown in Figure 3. The majority of machine designs permit for container motion alterations of vibration frequency by means of variable gears, of vibration amplitude by means of adjustment of eccentric weights and of vibration time by means of settings on a clock.

According to the number of containers a distinction is made between single and multiple container plants (compare Figures 3a and b). The next development step is the continual plant (Figures 3c and 4). In this case the chips are not removed from the plant after the work sequence, but rather die-castings are sifted out and unloaded. The chips are re-introduced into the vibrating container.

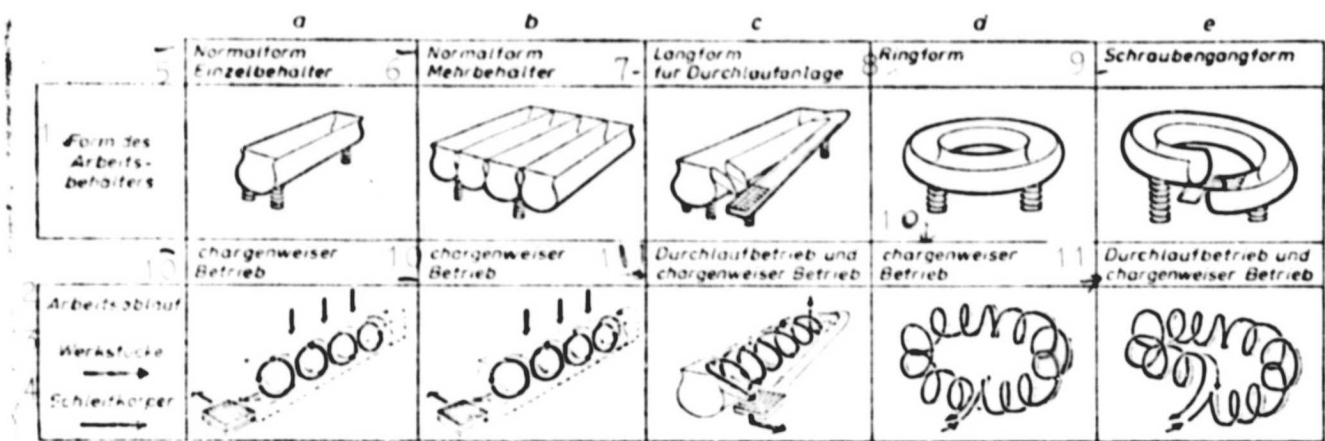


Figure 3: Schematic Representation of Design Types of Vibratory Finishing Devices, Taken from Footnote 1, page 2.

Key

- 1 Shape of the container
- 2 Work sequence
- 3 Work pieces
- 4 Abrasives
- 5 Normal shape - single container
- 6 Normal shape - multiple container
- 7 Long form for continuous operation
- 8 Toroidal shape
- 9 Threaded shape
- 10 Batch operation
- 11 Continual and batch operation

Subsequent to the long shapes for vibrators, vibrators with spiral design were introduced. These vibrators have a toroidal or thread-shaped vibration container, which induce a toroidal motion of contents (Figures 3d and e as well as Figure 5).

Purpose of the these spiral vibrators is to reduce the required controls to as great an extent as possible while keeping spatial requirements to a minimum. The die-castings are introduced into the vibrator manually or also via special supply devices. After a single or several circulations in the vibrator the die-castings are separated from the chips by means of a built-in sifting section and unloaded. The addition of compounds may be automated by means of a dosing and spray device.

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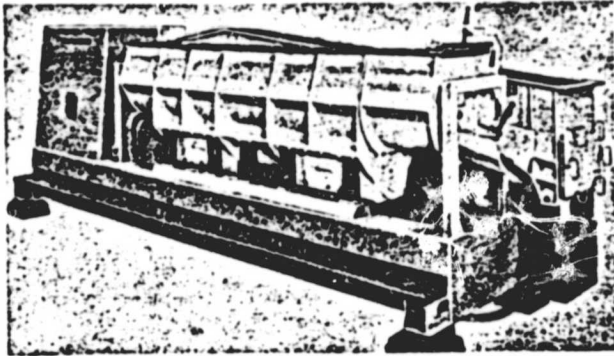


Figure 4: Long Design of Continual Vibrator,
Taken from Footnote 1
Page 2.

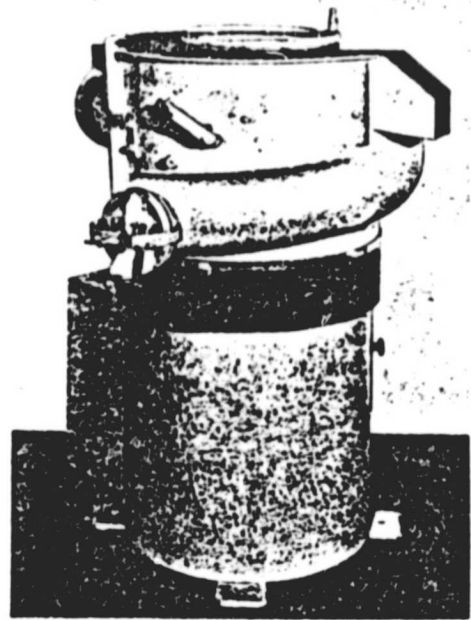


Figure 5: Spiral Design of Continual Vibrator, Taken
from Footnote 1 Page 2.

Drying of the Die-Castings

The die-castings, usually sensitive to moisture, must be dried after wet vibratory finishing. Water spots on NE-metal die-castings reduce appearance quality and often make the die-castings unmarketable.

/8

Drying may be carried out by means of:

1. Immersion of a basket with completed parts in a container filled with hot water. The parts are heated for a short period of time, taken out of the water, shaken and left to stand. The heat in the die-castings leads to evaporation of the residual moisture on these parts;
2. Hot air in rotating drums. The die-castings release the moisture when run through these drums with an inclined axis. In addition resin-free hardwood granules are often added. Instead of the rotating drums heated ovens are often used with circulating bands of stainless steel as transport means;
3. Application of dewatering fluids. These dewatering fluids

infiltrate the water drops on the die-castings due to their large moisturizing forces. Since water is heavier than these fluids, the water collects at the base of the container and may be drained from time to time in a simple manner (Figure 6). A newer development consists in arranging jet nozzles in a continuous automatic system, so that deep holes may be reached more effectively. The composition of dewatering fluids may provide for an additional protective film against corrosion on the treated parts.

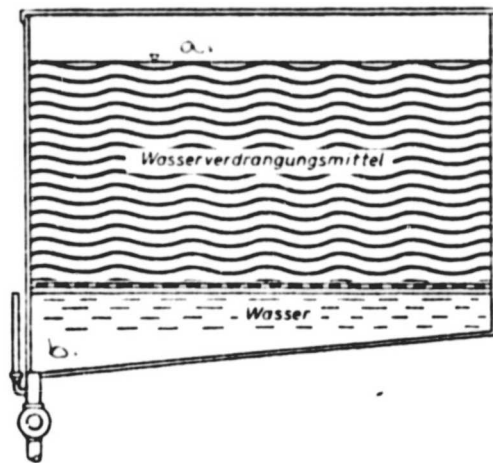


Figure 6: Schematic Representation of the Drying with Dewatering Fluids, Taken from Footnote 1 on Page 2.

Key

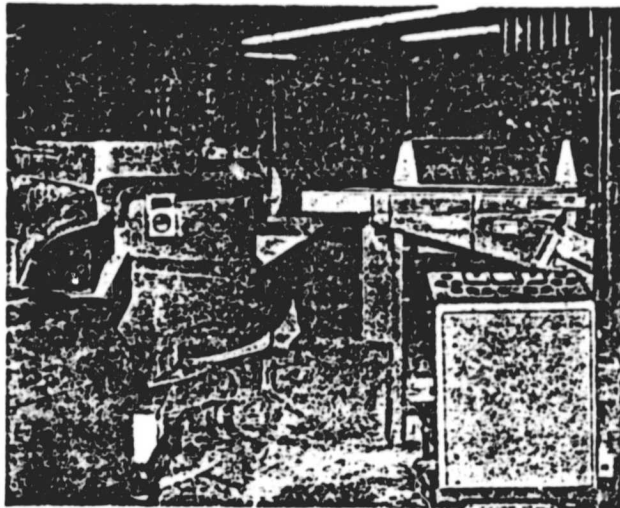
- A Dewatering fluids
- B Water

Further Developments and Costs

For special die-castings devices may be arranged subsequent to the vibrators, making possible the complete removal of chips by means of turning of the die-castings, even when deep impressions are present.

By means of the arrangement of die-casting collector, transport device to the vibrator, vibratory finishing plant of a spiral design and drying device with subsequent conveyor belt, a fully automated /9

deburring is achieved. Only a single person may supervise several machines where necessary, including the transport of parts to and from the plant. Figure 7 shows an example for an automated plant.



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Figure 7: Fully Automated Vibratory Finishing Plant,
Taken from Footnote 1 on Page 2.

The procedure becomes more economical with rising personnel costs. The spatial requirements of the place previously necessary for manual deburring was a multiple of that for this procedure. The regularity of deburring simplifies control, so that statistical methods may be applied. Several examples for the effect of vibratory finishing are shown in Figure 8.

Summary

The removal of burrs from die-castings may be carried out very economically in the vibratory finishing procedure. Design and method of operation are described. Through the application of vibrators of spiral design in combination with transport devices, with automated supply of compounds and with a drying device deburring may be automated. The devices may be installed in production lines where necessary.

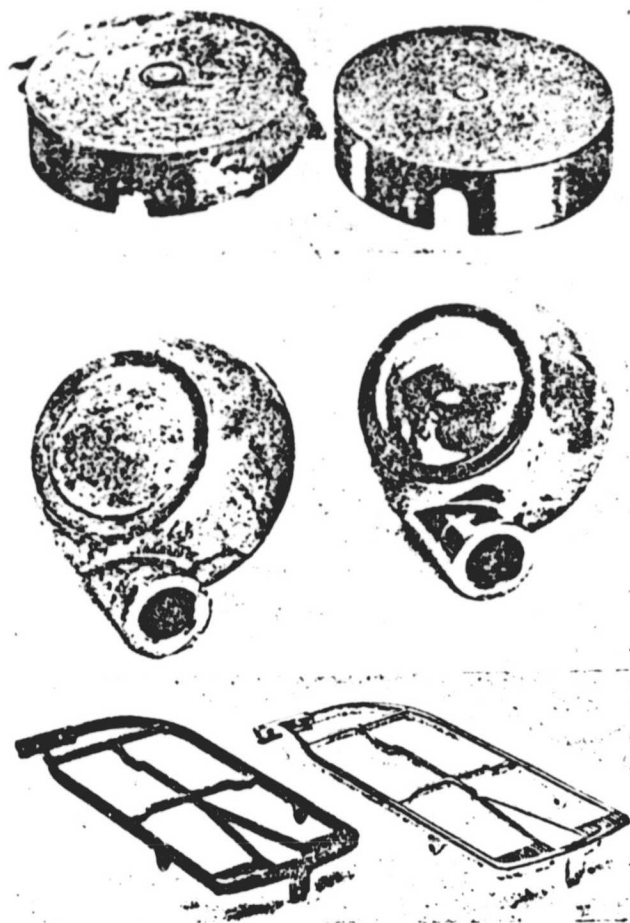


Figure 8: Examples for the Deburring Procedure of Vibratory Finishing Using Various Die-Castings

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